

§ 33.19

(e) Unwanted accumulation of flammable fluid and vapor must be prevented by draining and venting.

(Secs. 313(a), 601, and 603, 72 Stat. 759, 775, 49 U.S.C. 1354(a), 1421, and 1423; sec. 6(c), 49 U.S.C. 1655(c))

[Amdt. 33-6, 39 FR 35464, Oct. 1, 1974, as amended by Amdt. 33-8, 42 FR 15047, Mar. 17, 1977; Amdt. 33-10, 49 FR 6850, Feb. 23, 1984]

§ 33.19 Durability.

(a) Engine design and construction must minimize the development of an unsafe condition of the engine between overhaul periods. The design of the compressor and turbine rotor cases must provide for the containment of damage from rotor blade failure. Energy levels and trajectories of fragments resulting from rotor blade failure that lie outside the compressor and turbine rotor cases must be defined.

(b) Each component of the propeller blade pitch control system which is a part of the engine type design must meet the requirements of § 35.42 of this chapter.

[Doc. No. 3025, 29 FR 7453, June 10, 1964, as amended by Amdt. 33-9, 45 FR 60181, Sept. 11, 1980; Amdt. 33-10, 49 FR 6851, Feb. 23, 1984]

§ 33.21 Engine cooling.

Engine design and construction must provide the necessary cooling under conditions in which the airplane is expected to operate.

§ 33.23 Engine mounting attachments and structure.

(a) The maximum allowable limit and ultimate loads for engine mounting attachments and related engine structure must be specified.

(b) The engine mounting attachments and related engine structure must be able to withstand—

(1) The specified limit loads without permanent deformation; and

(2) The specified ultimate loads without failure, but may exhibit permanent deformation.

[Amdt. 33-10, 49 FR 6851, Feb. 23, 1984]

§ 33.25 Accessory attachments.

The engine must operate properly with the accessory drive and mounting attachments loaded. Each engine accessory drive and mounting attach-

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ment must include provisions for sealing to prevent contamination of, or unacceptable leakage from, the engine interior. A drive and mounting attachment requiring lubrication for external drive splines, or coupling by engine oil, must include provisions for sealing to prevent unacceptable loss of oil and to prevent contamination from sources outside the chamber enclosing the drive connection. The design of the engine must allow for the examination, adjustment, or removal of each accessory required for engine operation.

[Amdt. 33-10, 49 FR 6851, Feb. 23, 1984]

§ 33.27 Turbine, compressor, fan, and turbosupercharger rotors.

(a) Turbine, compressor, fan, and turbosupercharger rotors must have sufficient strength to withstand the test conditions specified in paragraph (c) of this section.

(b) The design and functioning of engine control devices, systems, and instruments must give reasonable assurance that those engine operating limitations that affect turbine, compressor, fan, and turbosupercharger rotor structural integrity will not be exceeded in service.

(c) The most critically stressed rotor component (except blades) of each turbine, compressor, and fan, including integral drum rotors and centrifugal compressors in an engine or turbosupercharger, as determined by analysis or other acceptable means, must be tested for a period of 5 minutes—

(1) At its maximum operating temperature, except as provided in paragraph (c)(2)(iv) of this section; and

(2) At the highest speed of the following, as applicable:

(i) 120 percent of its maximum permissible r.p.m. if tested on a rig and equipped with blades or blade weights.

(ii) 115 percent of its maximum permissible r.p.m. if tested on an engine.

(iii) 115 percent of its maximum permissible r.p.m. if tested on turbosupercharger driven by a hot gas supply from a special burner rig.

(iv) 120 percent of the r.p.m. at which, while cold spinning, it is subject to operating stresses that are equivalent to those induced at the maximum operating temperature and maximum permissible r.p.m.